Enterprise Systems Adoption: A Sociotechnical Perspective on the Role of Power and Improvisation

Teresa Waring, Northumbria University, Newcastle Business School, UK

David Wainwright, Northumbria University, Newcastle Business School, UK

Dimitra Skoumpopoulou, Northumbria University, Newcastle Business School, UK

ABSTRACT

Enterprise wide integrated systems (ES) have been extensively procured in large organizations but much research fails to develop sociotechnically informed approaches that facilitate their implementation within complex organizational environments.

In this paper we take a critically informed sociotechnical approach to power and improvisation in ES implementation. A review and synthesis of the pertinent literature, has led to the development of an analytical framework. This framework has been used to explore these concepts through a longitudinal, ethnographic study of an ES within a UK university.

The contribution of this paper is a combined 'circuits of power-improvisation' (CPI) framework which can facilitate a better understanding of ES implementation, sociotechnical theory and practice. Lessons learnt from the study may potentially be used to avoid some of the problems experienced due to the lack of recognition of the important role of power and improvisation in what may be misrepresented as planned strategic and deliberate organizational change.

***Keywords**: sociotechnical, systems, socio-technical, enterprise systems, improvisation, power, ethnographic study, circuits of power, critical theory, higher education*

INTRODUCTION

In the last two decades, increasingly complex forms of organization have developed in response to the pressures from globalisation, economic uncertainty and market instability. In addition, rapid technological developments, especially in information and communications technologies have provided opportunities for the adoption of new management practices, especially those based on principles of performance monitoring, reporting, accountability and control. This is particularly prominent in both the private and public sectors, where objectives focusing on efficiency, competitiveness, quality, and accountability have led to an emphasis on the development of new metrics underpinned by a culture of performance management, greater centralisation and hierarchical systems. In order to facilitate and reinforce these new management regimes, a deliberate strategy has often entailed the procurement, adoption and implementation of Enterprise Systems (ES). This is particularly evident in sectors such as Higher Education in the UK where, in the past, there have been more professional and collegial forms of organization, professional autonomy and localised decision making (Fowler and Gilfillan, 2003; Pollock and Cornford, 2004; Oliver and Romm, 2009; Wagner et al., 2010). The rise of managerialism, underpinned by ES technology, has given rise to a new form of technocracy that has begun to dominate the human and social aspects of work and knowledge based systems that have been developed over many years in organizations. This raises new issues regarding maintaining an appropriate balance between human, social and technical aspects of work thus giving rise to the need for more informed sociotechnical approaches and methods to be adopted in ES implementations.

Emerging research (Wagner et al., 2010; Dong et al., 2009) would also appear to indicate that many organizations, although having ambitious Information Technology (IT) strategic plans in place, find large scale enterprise systems overwhelming during implementation and may adopt organizational actions which respond to unfolding events resulting in unexpected and unintended consequences of the implementation as it progresses. One such consequence may be the ability to engage in opportunistic re-organization strategies afforded by the assimilation of 'new managerialism' (Clarke and Newman 1997) within the organization and, with it, a culture of command and control that is often incongruent with existing management cultures and organizational structures (Deem, 2004; Deem and Brehoney, 2005). The effects of ES adoption and its relationship to the redistribution of power and the alteration of political structures may lead to new policies, strategic opportunities and threats within organizations. This is an area that appears to be under researched. However, ES, once adopted, can also act as a catalyst for organizational and work based improvisation, thereby creating new and unanticipated power relations, managerial roles and structures.

The aim of this paper is to contribute to sociotechnical theory, by examining IS improvisation practice using the lens of a power and improvisation model that explicitly recognises the concept of power and its role in IT enabled organizational change within the wider context of enterprise systems adoption and implementation. Unlike Orlikowski's (1996) 'open-ended' highly configurable groupware IT, and Elbanna's (2006) 'successful' manufacturing ERP implementation, the ES under consideration here is one implemented within a highly complex UK Higher Education (HE) organizational environment. Our critically informed and sociotechnical approach adopts the 'circuits of power' framework (Clegg, 1989; Silva, 2007) and relates this to an improvisational model of change to surface issues and actions that bring with them unintended consequences for organizations.

In the next section we discuss the theoretical concepts that underpin our work and examine the fundamental ideas around improvisation and power and how the two may be linked. The primary research involved a longitudinal case study of a UK HE institution which

implemented an ES and this is presented in the third section. The case is then deconstructed and analysed by relating it to the improvisation and power concepts previously formulated. The final section presents the implications of this research for future ES adoption and implementation, and reflects on the utility of developing improved theoretical models of improvisation to surface issues of power and political relations in organizations. It is proposed that this will add to the body of sociotechnical theory and lead to a better understanding of improvisation enabling opportunities and actions to be taken that result in increased value for stakeholders who may be the potential users and benefactors of ES applications.

IMPROVISATION AND ENTERPRISE SYSTEMS

Both the research and practitioner literature concerning the implementation of enterprise wide systems (ES) in large organisations is replete with normative models, methods and guidelines providing prescriptions for implementation success. One area of research which appears to have relevance to the ES implementation debate but which has tended to be largely overlooked is the important role of organisational actors and improvisation during the process. This lack of formal recognition is rather paradoxical however, as it appears that no matter how highly structured and well managed the organisation is, or how experienced the project teams are in terms of IS/IT implementation, improvisation is often brought to bear in situations where rubrics, formally planned approaches and methods fail (Cibbora, 1996). Research on improvisation has received increased recognition within the contexts of organizational change (Ciborra, 1996; Moorman, 1998), punctuated sociotechnical change and information systems (Lyytinen and Newman, 2008), management (Mangham and Pye 1991; Weick,1998), bricolage (Lanzarra, 1999), tailorability (Morch and Mehandjiev, 2000) and information systems development and implementation (Orlikowski, 1996; Elbanna, 2006). The literature also defines its other foundational areas as sense making (Weick 1995), innovation (Weick 1999; Kamoche and Cunha, 2001), emergent change (Mintzberg, 1994) and adaptive structuration (Desanctis and Poole, 1994). Nevertheless, what is often missing from this literature is a formal consideration of the power and political environment within which these improvisations occur.

Before considering how improvisation can inform ES implementation theory it is essential to better understand the concept, and its historical research context.

Defining the concept and the language of improvisation

The concept and hence the language of improvisation is not only restricted to the information systems field and there has been a great deal of research carried out in anthropology, arts and management studies generally and organizational change management more particularly. Early organisational researchers grounded their studies of improvisation in the arts, especially jazz music owing to improvisation and the centrality of ‘bricolage’ (Cunha et al., 1999; 2012). Researchers then moved the debate away from the arts into management and organizational settings where they attempted to develop definitions of organizational improvisation and show its relevance in competitive environments (Ciborra, 1996).

When one considers the totality of definitions available some common themes relevant to management can be identified. First, in these contexts, improvisation must be *organizational* because actions are carried out by organizational actors within teams, on their own or on behalf of the organization. Second improvisation can also be seen as the *conception of action as it unfolds* and finally improvisation implicitly suggests that it can only take place where there are *resources* and individuals able to make use of these resources. This is where the concepts of ‘*improvisation*’ and ‘*bricolage*’ are closely related. For example improvisation implies the pre-existence of a set of resources, be it a ‘plan of action’, knowledge or a social structure, upon which variations can be built (Orlikowski and Hoffman, 1997). Also if improvisation means to

respond in real time then it follows that improvisers cannot wait for optimal resources to be deployed and have to tackle the issues at hand with what is currently available (Cunha et al., 1999). *Bricolage* on the other hand has been defined as "*making things work by ingeniously using whatever is at hand, being unconcerned about the 'proper' tools and resources*" (Thayer, 1998:239). These concepts build upon original notions identified in anthropology, cultural studies and the work of Claude Lévi-Strauss.

Improvisation research and its context within the IS field

One of the most influential conceptual thinkers and writers within IS on improvisation and IS development is Claudio Ciborra. Working in the interstices of the management, information systems and organisational behaviour fields, Ciborra (2002, p.49) expands on the essential differences and nuances between the terms bricolage, improvisation and hacking. He defines this as*:*

"Bricolage means tinkering through the combination of resources at hand. These resources become the tools and they define in-situ the heuristic to solve the problem. ..With bricolage, the practices and the situations disclose new uses and applications of the technology and things…….Improvisation puts an emphasis on the suddenness, extemporaneity and unpredictability of the human intervention, though highly situated….hacking is devising and implementing a program to perform a certain useful function by making use of any technology in an original, unorthodox, and often playful way….where hacking stands to software engineering tenets as bricolage stands to organisational procedures…"

Ciborra (2002) expresses a caveat that these expressions can signify or be interpreted as derogatory practices or deviant management behaviours. He calls for a *'Copernican revolution'* where improvisation and bricolage is seen as the norm in strategy and systems implementation representing a valid alternative to rational and deterministic planning and decision making. These practices are particularly relevant to the adoption of ES providing a cognitive and organisational capability to convert these systems, applications and data into practical, situated, and unique knowledge for action. Ciborra (2002) also stresses the importance of considering 'mood' as a presupposition for improvisation as situated action. Ciborra's work, although mostly conceptual, acts as a complement to interpret more empirical studies that investigate improvisational change and methods closely related to bricolage.

Recognising that there was a need to develop better theoretical insights into large integrated IT systems implementation, Orlikowski and Hofman (1997) conducted an empirical study of organisational improvisation due to the adoption of IT groupware. Their original aim was to describe how improvised change can take place in a series of deliberate, emergent or opportunistic phases. Here three different types of change are recognised consisting of: anticipated, emergent and opportunity-based change (Figure 1).

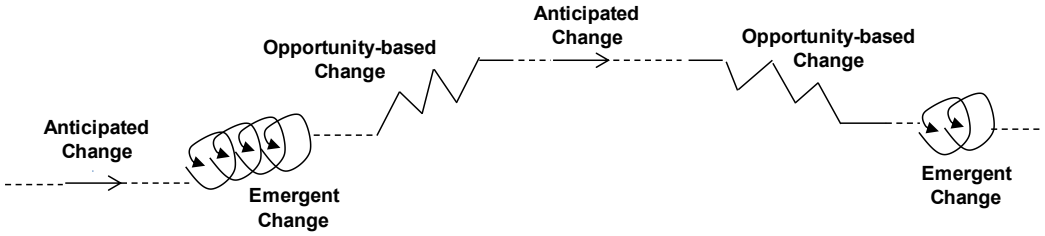

Figure 1: An improvisational Model of Change Management over Time (Orlikowski and Hofman (1997:13)

Anticipated changes are those that are planned ahead of time and occur as intended. Emergent changes arise spontaneously from local innovations and are not planned or intended.

Opportunity based changes are those that are introduced purposefully and intentionally in response to an unexpected opportunity, event or breakdown. Orlikowski and Hofman (1997) view these types of change as building on each other iteratively over time. The use of the new technology typically involves a series of opportunity-based, emergent and further anticipated changes the order of which cannot be pre-determined. This is because of the nature and complexity of change and its interaction with events and the environment within which it is taking place. They also suggest that "*there is a discrepancy between how people think about technological change and how they implement it....that contributes to the difficulties and challenges that organizations face as they attempt to introduce and effectively implement technology-based change*" (Orlikowski and Hofman, 1997:11). However in their description of the case company Zeta, Orlikowski and Hofman (1997) make no mention or explicit reference to power or political actions that may influence or affect the outcomes of these improvisation types either in the supporting case study analysis or theory reviewed. In their study of groupware (open ended) technology adoption, the anticipated strategy and any unanticipated outcomes are all viewed highly positively. Negative consequences related to actual and potential user resistance, due to power and political issues, are rather 'downplayed' resulting in a 'rose tinted spectacle' view of planned and emergent organizational change. Yet, the power and political implications do not form part of the improvisation framework in Figure 1.

POWER AND INFORMATION SYSTEMS

Although there are IS studies which address power and politics it is not our intention to explore them at any length in this paper. Our intention is to focus upon IS research that is based upon Clegg's (1989) 'circuits of power' (Silva, 2002; Silva and Backhouse, 2003; Silva, 2007). Silva (2007) argues that the 'circuits of power' provides a rich analytical framework for the study of power and IS and has been derived from a number of studies on power within sociology (e.g. Callon, 1986; Law, 1986; Latour, 1987) as well as insights from Foucault's (1977) disciplinary power. This framework (Figure 2) also has the added benefit in that it relates the concepts of power to organizations.

In Figure 2, ***episodic power*** relates to agency and within the context of IS Silva (2007) suggest that the focus of study may be on 'A's' exercise of power over 'B' (A and B are different agencies) and 'B's' possible resistance to some aspect of an IS adoption. Law (1991) views this as 'power over' or causal power and suggests that individuals have a scope of actions and that specific scope of action is given by the structural characteristics of the individual's particular context. Clegg (1989) complements episodic power by drawing on the work of actor-network theory and specifically the concept of 'obligatory passage points'(OPP) and the principle of 'symmetry' (Callon, 1986; Latour, 1987). Silva and Backhouse (2003) suggest that OPPs are the results of four 'translational steps', problematization, interessement, enrolment and mobilization, after which B has no other choice but to accept the OPP. The movement between steps is called displacement and involves discursive practices. When displacement occurs, power is exercised. Silva (2007) argues that information systems can be viewed as OPPs.

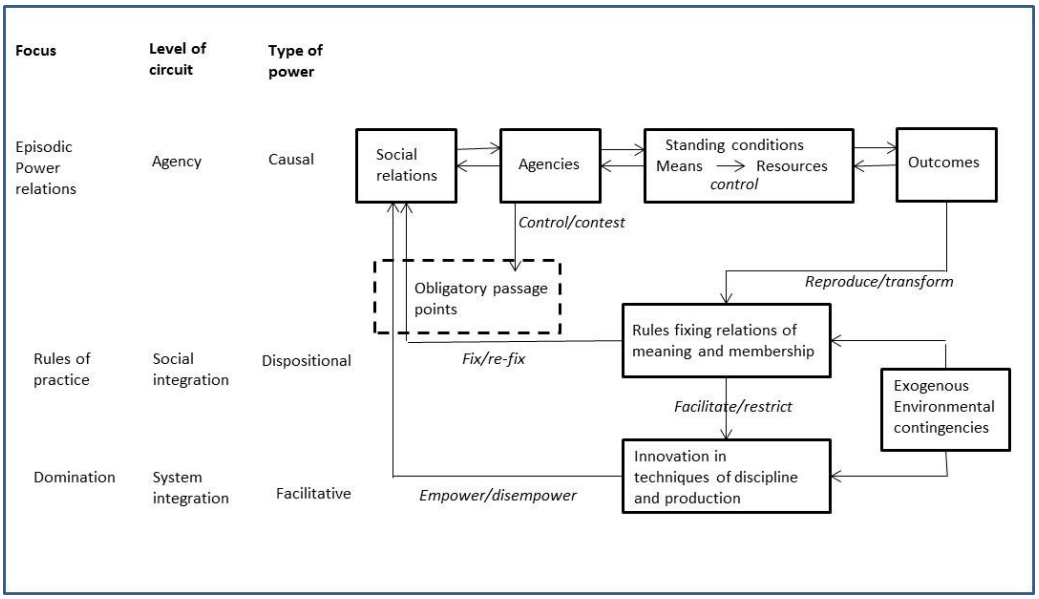

Figure 2: Circuits of Power (Clegg, 1989:214)

The 'circuit of ***social integration'*** addresses dispositional power. This capacity is a characteristic that distinguishes between having and exercising power. Power in this context is a facility that entitles someone to exercise power but it does not necessarily imply its exercise (Clegg, 1989). Clegg (1989) defines social integration in terms of the relation between rules of meaning and membership. The analysis of this circuit identifies the legitimate (formal rules) and illegitimate (informal rules) dimensions of power within the organisation

System integration within the context of power is viewed as facilitative and is understood in terms of its ability to produce and achieve collective goals. In the organizational context, system integration is the technological means of control over the material and social setting and the skills associated with these means (Lockwood, 1964). Besides the material means of production, Lockwood includes in systemic integration the material means of surveillance. In short, system integration is constituted by techniques of production and discipline. System integration deals with facilitative power because the material conditions of production might empower or disempower agencies in their productive activities. The circuit of system integration is the major source of change in the circuits of power framework, particularly when the material conditions of production are altered: hence its relevance to improvisation and our study. Changes in the circuit of systemic integration will entail new agencies, techniques and practices that the circuit of social integration might find difficult to resolve.

Improvisation, Power and Information Systems

Exploring the relationship between power and improvisation is challenging and, within IS, Silva (2002) has been one of the few researchers who have attempted this. Silva's (2002) case study, conducted in the context of a strategic outsourcing of information systems in two hospitals in Guatemala, took a narrow definition of improvisation as defined by Weick (1993) and through the lens of 'facilitative power' examined how the outsourcing was conducted. Although insightful it does not address more specific power issues within IS implementation. We propose that this work can be developed further by utilising Clegg's (1989) original 'circuits of power' framework and more recently Silva and Backhouse's (2003) adaption within the context of a system implementation where improvisation was an important activity at various stages of the project. Our intention is to demonstrate our approach by developing and applying a 'circuits of

power – improvisation' (CPI) framework to an Enterprise System implementation within a university. We have identified in Table 1 where exploration of the data will occur.

Circuit	Type of Power	Our interpretation of the framework in the context of improvisation
Episodic	***Causal Power***: When A makes B do something B otherwise would not do.	Who are the As and Bs when the implementation is initiated? Who are the systems champions and are there resisters? What improvisations occur and who are the As and Bs? What are their objectives? What strategies are employed within the improvisation are adopted by the As and Bs? What resources are mobilised by the As and Bs within the improvisation and what are the outcomes? Can opportunity-based outcomes be explained?
Social Integration	***Dispositional Power:*** Provides the conditions for As to exercise power. Rooted in rules of meaning and membership of the organization.	What are the organizational rules and norms prior to implementation that place the As and Bs within their respective position? How do the improvisations affect these rules and norms? Are there new rules and norms? What are the meanings ascribed to these rules and norms as sense making takes place?
Systemic Integration	***Facilitative Power***: This power causes the organization to generate outcomes and is defined by techniques of production and discipline.	What techniques are employed by As to ensure Bs compliance during/after an improvisation? What are the work tasks that are affected and how have they changed? Have the improvisations led to the system as a resource to instil discipline? How has this occurred?

Table 1. The 'Circuits of Power-Improvisation' (CPI) Framework and our interpretation

IS improvisation does not take place without reference to organizational power and politics. Distinguishing the nature and circuits of power within an improvisation and the resultant changes has the potential to further our understanding of improvisation in an ES context. It is proposed that our understanding of the three types of improvisational changes (anticipated, emergent, opportunistic) identified by Orlikowski (1996) and Orliksowski and Hofman (1997) can be enhanced if examined against the combined circuits of power improvisation framework, Table 1. The three circuits of power, episodic, social integration and systemic integration may provide a richer account of the complex power and political relations within an organization type that contains both micro and macro-level improvisations and high levels of procedural memory. These typically encompass higher levels of routine knowledge and well defined rules (Tjørnehøj and Mathiassen, 2010) and are typically resident within a professional and academic led university and HEI culture.

RESEARCH METHODOLOGY

The study of the ES, a university student administration system (USAS), implementation began in 2007 as an ethnographic study and lasted five years. Ethnography can be defined as a '*style of social science writing which draws upon the writer's close observation of and involvement with people in a particular social setting and relates the words spoken and the practices observed to the overall cultural framework within which they occurred*' (Watson 2011:205). Watson (2011) argues that ethnography should involve participant observation, content analysis of documents, stories, myths, rituals, symbols and other artefacts. This may be supplemented and strengthened by interviews, statistical analysis and even small surveys. The research began with an in-depth critical analysis of the documentation leading up to the USAS implementation. This was followed during 2008 by twenty two interviews averaging one hour each, with university staff who had been in the university for no less than five years. As in the case of Doolin (1998) the interviewees were interviewed more than once over the time period.

Interviewees were taken from across the university, Modern (pseudonym). A non-directive interviewing technique was used which allowed respondents to express their own views about organizational life in their own words rather than force them into predetermined categories (Hirschheim and Newman, 1991). The interviews involved a discussion of issues surrounding the participants' prior experience of student information systems, the implementation of USAS, life in the organization and change during and after USAS went live. Interviews were audio

taped with permission, transcribed and returned to the interviewees for verification. Anything that was felt by the participants to be problematic was removed from the transcript and after one interview a respondent decided to wholly withdraw her transcript.

Participant observation took place throughout the research study and was recorded using a diary. As a member of staff one of the authors was able to participate in the activities which contributed to the academic role in providing student data. Working alongside other colleagues she was able to observe the action of various individuals and interpret them in order to gain insight into the cultural manifestations of the organization (Bryman 2004). Burgess (1984) also argues that participant observation can increase the richness of the research and Waddington (2004) suggests that being part of day to day activities or important events can provide valuable understanding of organizational practice which can become ritualised over time. In order to understand administrative life the same author spent a number of periods of observation during peak times in the academic calendar: student enrolment in October, marks recording after assessment in February and examination board preparation time in June.

Using a general inductive approach informed by grounded theory (Crabtree and Miller 1999; King 2004) the interviews, documentation and diary data were coded according to theoretical concepts suggested by the data rather than imposed by the researcher. The approach used involved a process of developing initial categories, grouping data, identifying patterns and then making comparisons to uncover shared elements and properties (Barley 1990; Van Maanen 1979). The documentation and transcripts were also read critically to identify statements which reflected values, beliefs and assumptions about USAS as well as for evidence of organizational stories, myths and rituals which may have arisen over the period of the research. The analysis of the case study is presented in a form of narrative taking into consideration the improvisations which took place and the elements of each circuit. Bearing these in mind the discussion explores what happened during the USAS implementation. The intention is to identify those possible elements or factors that have resulted in the system being adopted by Modern University in the manner it has. Our aim is not to arrive at a conclusion isolating certain factors or improvisations which have had maximum impact on the organization but to articulate an explanation covering a number of the power and political factors involved. The framework is a set of concepts that will support researchers of improvisation and power to collect, analyse and interpret data and practitioners to identify elements and processes that can hinder or support the introduction of a new ES.

THE CASE OF MODERN UNIVERSITY

Modern University is a large city based university with over 3000 employees and at the beginning of this research was a decentralised organisation consisting of nine academic faculties. In the mid-2000s Modern failed to deliver appropriate student information to central government and turned to an ES (USAS) solution to address their difficulties. However where research and finance was a major consideration in other higher education research studies the focus at Modern was on the students, the courses offered and on the management of related data. A business case was accepted to make USAS the preferred alternative to upgrading an existing Oracle system. USAS is used by over 70% of the UK Higher Education (HE) market, by 25% of the Scottish Further Education (FE) market and has become the de facto standard for student information systems. Like many other integrated systems of its genre it has been built around an ‘ideal’ model of university administration consisting of modules to support admission of students to university, programmes to manage the curriculum through a standard three year degree, a student module to manage enrolment, fees, progression throughout the degree and tools to ‘enable’ users to analyse, process and extract data. These enterprise systems are marketed as being highly flexible with the opportunity to customise to individual university needs. Thus with other similar universities introducing it and at meetings with the vendors senior university

managers were given assurances that the system could provide the solutions for which they were looking. Anticipated change from a senior university management perspective was centralisation of student data management and more efficient use of both academic and administrative staff resources.

Improvisation and Episodic Power

'Episodic power' focuses on the relationship between resources and outcomes and is intrinsically linked to the improvisations which occurred as organisational members drew upon available material, cognitive, affective and social resources (Cunha et al., 2012). Led by the Director of Finance, and supported by the university registrar and two other senior staff as well as representatives from the vendors, the plans for the implementation of USAS started in 2005. In order for USAS to be introduced into Modern University a budget was set up, a number of new groups or teams were established and material resources released. The two groups that played a major role in the project were the USAS implementation team (technical staff employed from internal university resource and external agencies) and the USAS liaison group (senior administrative staff seconded from each of the departments) both of which were intended to be temporary structures to be dismantled after the system was up and running. There was little academic staff involvement. The USAS implementation team were seen as the technical experts, housed in their own suite of offices, trained by the USAS vendors, who would lead the technical aspects of the implementation. The USAS liaison group would support departments in getting the data into the system and extracting the requisite information. Examination of minutes of their meetings suggest the focus prior to 'going live' was on USAS technical issues and not on organizational change. This approach is not unusual within these types of information technology projects as the initial focus is to ensure that the physical resources are in place and being accessed by the appropriate staff (Coombs, Knights and Willmott 1992; Parker 2000). Nevertheless the decisions on who has access to the new technology are political and subject to control of the dominant group (Doolin 1998).

The USAS implementation team and the USAS liaison team worked closely together from 2005 until the system went live in 2007 and shared an excellent working relationship. One example of an area that they jointly worked on was student data migration from all of the department systems to the new USAS system. USAS has a very rigid set of data structures which cannot be altered. It was the responsibility of the USAS implementation team to transfer the current university student data into the structures available in USAS. This was not easy as each department kept their student records according to their own needs. The USAS team were also faced with determining how the standardised approach to student data collection would be managed going forward. The Director of Finance and his advisors anticipated this would be a simple transfer of common data into structures congruent with university requirements and facilitated by the USAS vendors. However Pollock and Cornford (2004) suggest that enterprise systems such as USAS overwhelm organizations so that they have little option but to implement 'default' settings which tend to emphasise similarities between organizations and not their differences. Thus individual departmental needs are disregarded in the quest to be 'up and running'. The USAS liaison group was asked to assist and advise on new degree programme codes which they did without reference to the academic colleagues who actually managed the students. Nicolini (2007) sees this assumption of 'knowing what is best for the rest' as a feature of many ES implementations as a dominant group, in order to make sense of their identity, imposes a view of practice intended to enhance their credibility and competence. Nevertheless this improvisation within USAS illustrates the use of affective resources where the two teams felt the need to support one another in overcoming a problem. In fact the lack of academic knowledge was not seen to be an issue (Briefing paper from USAS Project Manager, 2005).

Thus what occured was an unanticipated emergent change which only became visible when the system went live.

Although academic staff had not been consulted in the lead up to 'going live' with USAS it was the administrative staff who were feeling the stress in relation to the new role they were expected to play. It was anticipated that all administrative staff who dealt with student data would be trained on USAS in time for 'going live'. The USAS vendors had a specific approach to training which they passed on to the USAS implementation team. This approach ensured that everyone used the system in the same way. However this training by the vendors was expensive and could not be rolled out across the university. Therefore the USAS project manager decided that the USAS implementation team would provide training for all. The problem was there were insufficient trainers to cover every administrator who needed training on USAS. Hence the improvised training was done in large groups in information technology laboratories with little interaction. Staff complained about the content and quality of that training.

Added to this training issue the USAS implementation team would not allow cascade training *' in case the wrong message was given'* so tensions were high as August 2007 approached. The power to determine the nature of the training is an opportunity based improvisation and is indicative of the growing internal credibility of the USAS implementation team not just with the senior management of the university but also over the departmental staff taking part in the training. These staff may never have encountered the USAS team prior to training and this acts to transform and re-enforce their identity and position in the organization (Coombs, Knights and Willmott, 1992).

Academic staff knew little about USAS until they returned from annual leave in September 2006. Student enrolment had taken place without their input and when term began there was chaos: staff were in the wrong rooms, students were on the wrong degree programmes, class lists were inaccurate. This was a result of a previous decision taken by the USAS implementation team and the USAS liaison team when developing degree programme codes for the system:

"At enrolment we found problems with the modules. Students were attached to the wrong modules.... This was due to misunderstanding about codes... I spent so much time correcting data, checking... It then impacted on Blackboard.. students going to the wrong lectures." (Administrator 4)

When the Academic Heads of department approached the USAS implementation team they were told it was 'teething problems' or that they were the only department with that particular problem. The USAS liaison team were overworked trying to sort out problems within the departments, problems that had not been anticipated.

In the context of the USAS system, looking exclusively at the episodic circuit of power provides insight into the strong position of the Finance Director, based on numerous resources, and his ability to manage his expectations for USAS through his appointed teams. Nevertheless by devolving responsibility improvisations are made at points in the project which may not be congruent with the sentiment of what is ultimately the target outcome. Also the result of an improvisation may not be felt for some time when it impacts on another aspect of organizational life. This is dealt with here through looking at the circuit of social integration.

Improvisation and Social Integration

This circuit deals with rules of meaning and membership. The USAS system influenced the way both academic and administrative staff interpreted the management style and priorities. The emphasis on the spending on USAS sent a strong message to all that USAS would be the only way that student data would be managed, that local discretion around student data was not to be tolerated and signalled the end of a more participatory approach to management.

Here we show how new social groups have become important within Modern University as well as the reactions and interactions of other staff with them. Tension between academics and administrative staff were high during 2007 and this was also the case within the administrative teams who were dealing with USAS on a day to day basis. Academic staff began to complain about their lack of information and inability to access the system. When they then tried to contact the USAS team for help they often found the phones 'off the hook' and emails not answered. Even going to their offices was impossible as the USAS team were in a suite of rooms protected by a digital lock. The eventual response of the USAS team was the development of 'rules of access'. Any enquiry or request for information had to be made through appropriate channels and only certain staff had access rights to the USAS team. Even though data was urgently needed to be entered onto USAS they enforced their training and access policy. Nevertheless even those who had been trained still found USAS difficult to work with:

"The system is so complicated, using codes, jargon and real problems with screens that it takes five times longer than the previous one... It is time consuming and complicated... we have a full time team working on it... USAS is their job now.. and we have ***good housekeepers*** *who know the system very well. We didn't have them with the Marks Recording System as we knew the system inside out." (Administrator, 6)*

The improvisation of 'good housekeepers' as an informal group of USAS experts with advanced skills to support early system difficulties has proved to be a very powerful influence within Modern and this group has grown to over 100 strong in 2012. Although in some HE institutions academic staff are able to enter their marks into USAS, Modern University have chosen to only allow administrative staff to have direct access to the system. Licence costs have been raised as an issue yet other more political aspects have been identified e.g. 'good house keepers' have some strong opinions about the ability of academics to deal with USAS if given access and it was not unusual to hear criticism of academics:

"A couple of departments have trialled letting academics put in their own marks. It is not something I would encourage in this department.. We have enough problems getting information from academics to get them to meet their own deadlines and that's with administrators helping quite a lot". (Administrator, 7)

Improvisation and System Integration

This circuit concentrates on techniques of control, discipline and production and explores who has benefited or been empowered by the improvisation and who has been disempowered. From our research USAS is a system which is not easy to use and has caused a number of challenges for Modern University that were not anticipated at the start of the project. During the two years within which the system was introduced the USAS team built up a lot of technical knowledge and it became obvious that their skills could not easily be lost to the organization. They became a permanent group when departmental staff recognised they needed increasing amounts of student information not readily available without some degree of USAS programming. They play a major role in the university and even have their own newsletters which are sent out to departments when new changes to USAS are to be implemented. Academics have little knowledge of this. The improvised processes and control introduced in 2007 have also impacted upon academic staff. For example academics no longer have access to the 'system' recording of marks for examination boards and have found themselves much more regulated by the departmental USAS administrative requirements:

" I put my marks into an EXCEL spreadsheet that does not talk to USAS. I put the marks into the Blackboard gradebook that does not talk to USAS. So not only have I recorded my marks three times – on the examination paper, EXCEL and Blackboard which increases the possibility of mistakes BUT I then have to put them onto a piece of paper that I hand to an administrator who then inputs them into USAS. This is nuts! I have asked if my spreadsheet can

be uploaded into USAS or the gradebook – but the system says NO! I get into trouble for asking the questions.(Academic 6 who is also a Course Leader)

Examination boards are also conducted in a different manner. USAS uses algorithms to calculate marks for modules and then the overall year average:

" ... discretion has now almost disappeared at the examination board. Degrees are now awarded mathematically. So if you get 59% and more than half of your modules are over 60% then you get a 2.1. If you get 59% and half of your modules scored less than 60% you get a 2.2." (Associate Dean).

Using USAS to calculate degree classifications has allowed management (both academic and administrative) to control academics behaviour at examination boards. Academics find it difficult to challenge the logic of the system and USAS as to do so would be to argue for paternalism and self-interest and deny students fairness (Clarke and Newman 1997). Added to this are penalties for not abiding by the USAS procedures and rules. Administrators report academics to their managers when they fail to meet USAS marking deadlines and it can be seen from our research that academics are increasingly becoming subjugated to a system that challenges their sense of meaning, identity and reality through their participation in an increasing range of disciplinary practices (Coombs, Knights and Willmott, 1992).

Within departments administrative staff who work regularly with USAS data have seen their status increase as managers require more information from the system. IT literacy is an essential skill for many administrative roles in Modern University and is reflected in salary levels. These new types of staff appear happier sitting at a computer than interacting with the student body and this is a cause for some concern with a number of academic staff. It is also divisive amongst administrative staff whose alternative skills are not recognised to the degree they once were.

Finally it can be seen that management have used an opportunity based improvisation to replace academic staff roles with those of administrators. Prior to USAS academics ran the student management systems and had access to all of the data. They also enrolled the students on their degree programmes and managed many of the processes around assessment periods. USAS and its centralising ability has facilitated the removal of the academic from many of these roles. To many academics this has been viewed negatively and some feel they have lost their status in the University. Even feeding back marks to students has been changed without academic staff consultation: students can now access their module marks from USAS almost as fast as the administrators are entering them. One academic stated:

"*I came back to my room after submitting marks to the administrator for my module and was greeted by some students who wanted to know why they hadn't got the mark they thought they should have been awarded. I was shocked as no one had told me the students could see their marks on USAS.* "(Academic 10)

Although it may be considered good practice to allow access to personal data it also involves communicating new processes to staff so that they can be prepared. Students are now more assertive than ever before and this is putting even more stress on university staff. This is not helped by the university documentation that continually refers to students as customers and as is often the case with that status comes new expectations.

DISCUSSION

In this section we explore how our work provides further insight into improvisation and how it relates to previous theoretical models. Orlikowski's (1996) work on improvisation is very insightful but it does not really address the much nuanced nature of improvisation and the difficult issue of power within it. Even the detailed work on power and institutionalization of IS discussed by Silva (2007) does not focus on the improvised actions which brought about the embedded IS. Thus it has been our intention to surface these concerns and to explore them

through the case study presented here. Figure 3 provides a timeline view of anticipated, emergent, problem and opportunity based change identified over the duration of the USAS project.

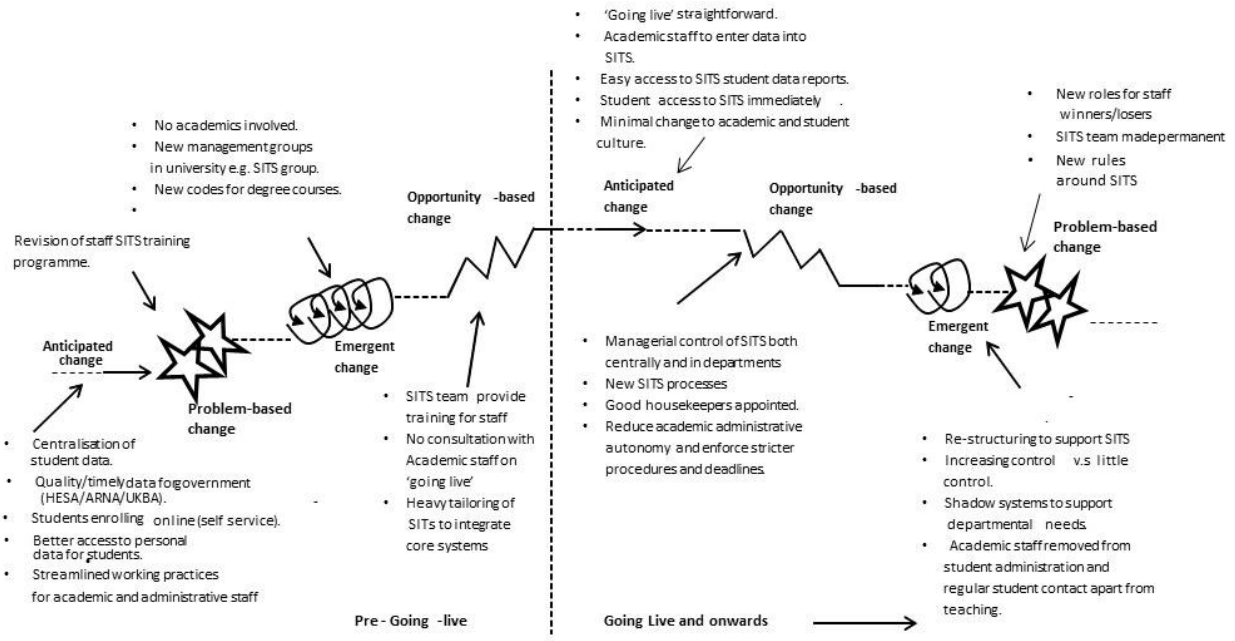

Figure3: A timeline showing improvisational change for the USAS system

This represents a literal adaptation of Orlikowski's improvisational change model. Although useful in terms of providing an overview of the major events and changes affecting academics and administrators, it still does not provide sufficient means of analysing the deeper power relations and causal effects of agents (human, organizational and technology) that may determine outcomes and result in new embedded and institutionalized routines, practices and structures. The original model did not show problem based change as distinct from emergent or opportunity based changes. Problem based changes can be equally significant triggers for improvisation requiring rapid actions and use of available materials to hand. This is more characteristic of bricolage as opposed to anticipated changes where there is a timeframe for planned actions according to some pre-determined goals and plans. In our analysis we have therefore included a new category for problem based improvisational change as opposed to focusing on anticipated changes. The anticipated changes can be seen in Figure 3 alongside the identified sequence of emergent, opportunistic changes and problem- based changes over the pre and post go live phases of the project. Added to this we have further deconstructed improvisational types related to emergent, opportunistic and problem based changes and mapped them to the various agencies and standing conditions as described by Clegg's (1989) circuits of power framework.

The Circuits of Power- Improvisation (CPI) Framework

It is evident from our research that improvisations are actions which do not occur without some reference to episodic power as actors adopt a bricolage approach to drawing on material, cognitive, affective and social resources (Cunha et al., 1999). At the start of the project USAS was viewed as the OPP on to which actors from across the university were enrolled to join the USAS team and USAS liaison team. The Finance Director presented no alternative solution to Modern University's data issues (problematization). The two teams were socialised alongside the vendor team and became very close sharing a specific USAS suite and shared goals

(interessement and enrolment). Thus as the project progressed they became project champions and gained in credibility within the university (mobilisation) (Callon, 1986; Latour, 1987).

The nature of the improvisations during the lead up to 'going-live' and their link to episodic power can now be seen. Most of the improvisations outlined here were undertaken by agencies that drew on the financial support of the USAS project budget as well as the affective and social resources of being part of a team. They did not need at that time to refer to anyone outside the USAS project. Nevertheless the teams were faced with issues that could not be addressed by financial resources e.g. codes for degree programmes or training of staff and at that point the improvisations called on other resources such as mental models and affective support of the other teams (Cunha et al.,1999). This is where episodic power comes to the fore as action is legitimised through standing conditions, resources and control (Figure 2). The mental models employed by the USAS teams for both the training and degree programme codes were limited as can be seen from the outcomes in our case study yet they were still able to determine that action.

Training was a major issue in this implementation and even when the USAS team took control it was quickly realised that they had insufficient human resource to undertake the level of training that was required for all of the administrators and academics across the university. Thus new improvised rules emerged which targeted certain staff and not others. Now these rules have become embedded within the organization and have further emerged over time through the social and systemic integration process.

Although there are many examples of how certain actors called on a variety of resources to support them in their actions during the USAS implementation what is not apparent initially is the link between improvisation and social integration. For the circuit of social integration in which rules fix relations of meaning and membership, certain fixtures of meaning are privileged and certain membership categories are aligned with these meanings (Clegg, 1989). Although social integration began prior to going-live it is clear that once the USAS system was in place it became more evident. To illustrate this it is apparent from our study that prior to USAS being introduced into Modern University academic staff led on most student related activities. When the system was introduced into the faculties in August 2006 only administrative staff had had training and hence were the only ones with access to the data and student information. The difficulties at 'going live' led to faculty registrars and Deans exercising their dispositional power in order to 'get things sorted out'. Thus new relationships emerge between the faculties and the USAS team which are determined by the dispositional power (Clegg, 1989) of the technologists. Yet within the faculties it is the administrators by virtue of their superior USAS knowledge which determines how USAS will be used, by whom and when access to it will be granted. The emergent nature of the Good Housekeepers improvisation has been useful to the faculties as they now have their own resource on which they can call for most USAS related business and therefore do not need to access the USAS team as frequently.

Clegg (1989: 224) views system integration as the circuit of power which is concerned with the empowerment and disempowerment of agencies' capacities, as they become "*..more or less strategic as transformations occur which are incumbent upon changes in techniques of production and discipline*" Improvisations which have taken place within Modern University have led to the empowerment and disempowerment of a number of staff. The centralised nature of the USAS system has led to a concentration of control at the centre of the university with little localised discretion in the faculties. Rules about all academic matters have ensured that conformity is the norm and intense monitoring is undertaken. Some of these rules are embedded within the USAS data structures and others have emerged through improvisations at key points in the academic year. Within the academic departments it is evident that there has been a power shift and in our interviews academic staff expressed concern about their perceived status and the increasing power of certain administrative staff.

The CPI Framework and Sociotechnical Theory Development

A number of studies have researched ES from a sociotechnical perspective, specifically to better understand ERP implementation (Lyytinen et al., 2009; Kwahk and Ahn, 2010) as well as investigating the role of improvisation and change in Information Systems development and implementation (Lyytinen and Newman, 2008). Mumford (2003; 2006) stated that sociotechnical systems should emphasise quality of working life and humanism at work. This approach should facilitate new forms of organizational innovation, often as a result of the adoption of new technologies that remove elitism, promote flatter hierarchies, develop multiskilling and facilitate more democratic processes of decision making. However, existing methods for sociotechnical design, such as ETHICS (Mumford, 2003), PSIC (Lyytinen and Newman, 2008) or SPRINT (Wastell, 2011), treat technology as neutral and do not explicitly deal with complex organizational power relations, neither focus on the challenges of improvised strategies and working practices often enabled by rapid new technology adoption typical of enterprise systems projects. Stahl (2007) recognises and critiques some of these limitations and proposes that sociotechnical approaches can be enhanced through adopting principles and theory associated with critical research in IS and computer and information ethics. The CPI framework proposed in our research and illustrated in this paper is 'critically' informed and can be used to surface issues of power, domination and control whilst taking a pragmatic view of ES implementation. This is where planned and deliberate strategies are supplemented by periods of opportunistic, emergent and problem based organizational change. This also responds to recent critiques and identified challenges for sociotechnical theory, methods and approaches relating to its inherent idealism and inability to influence IS innovations during design, use and implementation whilst neglecting power dynamics and the inability to legitimize and sustain spontaneous innovation (Avgerou and McGrath, 2007; McGrath, 2005).

CONCLUSIONS

IS research in general, and sociotechnical research in particular, must be prepared to build on theoretical models and frameworks that have the potential to provide better insight into the complex area of ES implementation. This must involve consideration of the power and politics which envelop these types of projects and recognition that improvisation is a reality when implementing them. Clegg's (1989) theoretical exploration of power offers great explanatory potential for large scale information systems adoption and implementation. Its later adaptation and use as a model by Silva and Backhouse (2003) demonstrates how it can be used to provide much deeper insight and a rich narrative for the institutionalization of an IS. Similar parallels can be drawn with the case of Modern where there were very obvious exogeneous factors associated with government policy that could be seen as triggers for rapid change and also a source of system integration and facilitative powers. Both ES projects were also characterised by the importance of improvised change as opposed to a reliance on more rational strategic and anticipated plans for the new developments. In both cases the administrative staff seized an opportunity to redevelop their skills and knowledge to operate and redefine the new systems simultaneously utilizing dispositionary and facilitative powers for new forms of both social and systemic integration. This is seen to be increasingly the case in organizations characterised by minimal structures and low procedural memories (Tjørnehøj and Mathiassen, 2010) but also perhaps more surprisingly in professional and administrative led organizational cultures where there might be high procedural memory and large bureaucratic structures but also opportunities for radical shifts in roles and responsibilities; hence the growth of managerialism (Deem, 2004).

Within the context of ES implementations there are relatively few sociotechnical, ethnographic and longitudinal studies that have been undertaken or published. Those that are published tend not to adopt a critically informed stance but focus on improvisation and bricolage

as a means of effecting strategic change and innovation as demonstrated by the use of bricolage for IS and business strategy alignment (Ferneley and Bell, 2006), improvisation for health information systems success (Heeks, 2006), rapid adoption of groupware technologies (Orlikowski and Hofman, 1997), and the effective management of outsourcing (Silva, 2002). Our exploration of the use of an adapted CPI framework more closely follows the later work of Silva and Backhouse (2003) but places additional emphasis on the types of improvisation undertaken as the ES project unfolds and how they relate to the different circuits of power identified. Our study is also relevant for professional and administratively intensive organization cultures such as universities but may also be applicable to other types of organization that exhibit similar characteristics. Besides being a tool for academic researchers to analyse and understand ES adoption and implementation post hoc, the CPI framework might also be used by more critically aware or ethical practitioners. This may be used more in real time as events unfold and materials to hand are utilised.

Change can happen extremely rapidly resulting in social, technical and systemic integration. Understanding the consequences of actions earlier in the ES implementation might negate undesirable effects and the over hasty institutionalization of potentially inefficient and damaging work practices and reorganization. The case of ES adoption and implementation is still live and on-going at Modern university. The student administration system has now been effectively institutionalized where academics no longer question its existence, extension or role within the academic decision making processes. The system now has embedded agency reinforced by both social and systemic integration circuits of power. The CPI framework will be evaluated for its potential to identify improvisation types as they occur and assess the potential changes needed for ethical exercise of episodic, social and systems integration circuits of power. We hope that in the future, improvisation will be seen as the norm and not a manifestation of deviant resistance to anticipated changes. A critically informed and sociotechnical view of power relations will enhance our efforts in facilitating more thoughtful and ethical change practices.

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